

## PATENT SPECIFICATION

DRAWINGS ATTACHED

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## COMPLETE SPECIFICATION

Improvements in or relating to Apparatus for the  
Manufacture of Metal Drums and Containers

We CROSSHALL ENGINEERING COMPANY LIMITED, British Company, of 47A, Marlborough Street, Liverpool 3, Lancashire, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to apparatus for use in the manufacture of metal drums and containers (all hereinafter for convenience included in the term "drum") and more particularly apparatus adapted to form in a drum body a rolling or strengthening bead and to curl or flange the adjacent end or rim of said body, and the invention has for its object an improved and simplified form of such apparatus adapted for operation by fluid pressure. A further object is to provide apparatus which, whilst having a short working cycle, will be economical in the use of the working fluid. A still further object is to provide apparatus which will accept any length of drum body, within limits, without adjustment.

Broadly, according to the invention, apparatus for the purpose specified comprises a fluid operable, e.g. pneumatic or hydraulic, double-acting, power cylinder; a series of bead-forming elements mounted in a plane normal to the axis of said power cylinder and adapted for radially outward and inward movements; means operable by said power cylinder for actuating said bead-forming elements; a curling or flanging die disposed co-axially of said bead-forming elements and adapted for displacement towards and away from said elements; and means operable by said power cylinder for moving said curling or flanging die towards said bead-forming elements subsequent to

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their operative bead-forming movement but before their retraction.

The invention is further described with the aid of the accompanying drawing which illustrates, by way of a part sectional elevation, an example of the same.

Referring to said drawing, the apparatus comprises a stout frame 10 mounted upon a base 11 wherein is supported a vertically disposed, double-acting, pneumatic power cylinder assembly 12. Mounted rigidly above said power cylinder 12 on uniformly spaced pillars 13 is a horizontal support plate 14 which is medially apertured and screw-threaded so as to adjustably receive as shown a vertically disposed, externally screw-threaded, tubular support post 15 which is locked in required position by a locking piece 15a. The upper end of said support post is flanged as at 15b and carries a pair of spacedly arranged, horizontal, medially apertured, guide plates 16, 17 between which is slidably disposed a series of circularly arranged, sectoral, bead-forming elements 18 adapted for radially inward and outward movement and which elements 18 are biased by spring means (not shown) towards their radially inward positions. The shaft 20 or an extension of the shaft of the piston 21 of the power cylinder extends through the horizontal support plate 14 (which is medially apertured) and an extension 20a thereof passes through said tubular support post 15 and carries at its upper end a wedge member 22 the axis whereof is disposed concentrically within the pitch circle of said bead-forming elements 18. Said wedge member 22, during the first part of the operative stroke of the power cylinder 12, is arranged so as to displace the bead-forming elements 18 radially outwards.

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Mounted on said horizontal support plate 14 is medially apertured lift plate 23 which, in turn, removably supports a curling die or ring 24 disposed concentrically of the axis of the power cylinder 12, and extending from said lift plate 23 through provided bearing apertures of the support plate 14 is a series (e.g. four) of thrust rods 25 each of which is surrounded by a helical compression spring 26 confined between a stop member 27 formed or provided at the lower end of said rod 25 and the under side of the support plate 14. A press plate 28 mounted on the piston shaft 20 below said thrust rods 25 is arranged so as to contact said rods in the latter part of the operative stroke of said power cylinder 12, and to thereby vertically displace the lift plate-cum-curling die 23, 24 against the influence of said compression springs 26.

Operation of the apparatus is as follows, a drum body to be beaded and curled is placed over the bead-forming elements 18 with its rim seated in the curl-forming channel 24a of the curling die 24. The power cylinder 12 is then actuated so that, in the first part of its operative stroke, the bead-forming elements 18 are moved outwardly by the wedge member 22 against the internal surface of the body whereby a circumferential bead is stretch-formed therein. In continued operation of the power cylinder 12, and whilst said bead-forming elements 18 are still in engagement with the formed bead, the curling die 24 is displaced in a direction towards said bead-forming elements 18 thereby to press-curl the rim of said body. During the return stroke of the power cylinder 12 said curling die 24 is disengaged from the now curled rim, and thereafter the bead-forming elements 18 are retracted whereby the drum body can be removed.

It will be seen that the screw-threaded association of the tubular support post 15 with the horizontal support plate 14 enables the operative distance between the bead-forming elements 18 and the curling die 24 readily to be adjusted. Further, the wedge member 22 may be adjustably mounted upon the piston rod extensions 20a thereby to vary the operative displacement of the bead-forming elements 18. Also, the lower end of the thrust rods 25 each are drilled and tapped to receive a bolt 30 the head 31 whereof functions as a striker head. The timing of the curling operation thus can be varied by adjusting the bolts 30. Conveniently, said bolts 30 are employed in conjunction with lock-nuts 32 to attach the stop members 27 to the lower ends of said thrust rods 25.

Preferably, said bead-forming elements 18 and curling die 24 are constructed and arranged so as to be interchangeable readily

with similar forming elements of various operative diameters.

Apparatus according to the invention may of course be constructed for use with its main axis, i.e. the axis of the power cylinder 12, arranged other than vertical, and be adapted for hand or foot controlled, or automatic, operation as desired. Further, the apparatus may be adapted to operate upon drum bodies which are other than of circular cross-section, e.g. bodies of square or rectangular cross-section, by appropriately configuring and arranging the bead-forming elements 18 and curling ring 24. In this latter instance support means may be provided for the planar sides of a drum body during the stretch-forming operation. Also, by the replacement of the aforesaid curling ring 24 by a flanging ring the apparatus may be adapted to bead and flange a drum body.

Apparatus according to the invention is particularly suitable for incorporation in high speed automatic production lines.

#### WHAT WE CLAIM IS:—

1. Apparatus for the purpose specified comprising a fluid operable, e.g. pneumatic or hydraulic, double-acting power cylinder; a series of bead-forming elements mounted in a plane normal to the axis of said power cylinder and adapted for radially outward and inward movement; means operable by said power cylinder for actuating said bead-forming elements; a curling or flanging die disposed coaxially of said bead-forming elements and adapted for displacement towards and away from said elements; and means operable by said power cylinder for moving said curling or flanging die towards the bead-forming elements subsequent to their bead-forming movement but before their retraction.

2. Apparatus, as claimed in claim 1, wherein said curling or flanging die is mounted on a centrally apertured lift plate, where-through extends the piston of said power cylinder, or an extension thereof, and said lift plate comprises a series of thrust rods adapted to be operated by a press plate mounted on said piston shaft.

3. Apparatus as claimed in claim 2, wherein said thrust rods are slidable within bearing apertures of a support plate fixedly connected to the power cylinder assembly.

4. Apparatus, as claimed in claim 3, wherein each of said thrust rods has mounted thereon a helical compression spring confined between a stop member formed or provided on said rod and the said support plate.

5. Apparatus, as claimed in claim 4, wherein a tubular support post is mounted upon said support plate concentrically about the piston shaft or an extension thereof, and the upper end of said support post carries

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- a pair of spacedly arranged guide plates between which is slidably disposed said series of bead-forming elements and said piston shaft or its extension carries a wedge member for actuating said bead-forming elements.
- 5 6. Apparatus, as claimed in claim 5, wherein said support post is axially adjustable relative to the said support plate.
- 10 7. Apparatus, as claimed in claim 5 or claim 6, wherein said wedge member is adjustably mounted on said piston shaft or its extension to permit of adjustment in the operative displacement of the bead-forming elements.
- 15 8. Apparatus, as claimed in any one of the preceding claims, wherein said bead-forming elements and curling or flanging die are arranged so as to be interchangeable with similar elements of various operative diameters.
- 20 9. Apparatus, as claimed in any one of the preceding claims, wherein said apparatus is arranged with its main axis vertical.
10. Apparatus, as claimed in any one of the preceding claims 1—8 inclusive, wherein said apparatus is arranged with its main axis other than vertical.
- 25 11. Apparatus, as claimed in any one of the preceding claims, arranged and adapted to operate upon drum bodies of circular cross-section.
- 30 12. Apparatus, as claimed in any one of the preceding claims 1—10 inclusive, arranged and adapted to operate upon drum bodies having cross-sectional shapes other than circular.
- 35 13. Apparatus for the purpose specified, arranged and adapted to operate substantially as hereinbefore described with reference to the accompanying drawing.
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1 SHEET This drawing is a reproduction of the Original on a reduced scale

